

## **Detailed Data Tables and Technical Notes: Who is dying with HIV/AIDS, and how has this changed over time?**

### **Technical Notes:**

To describe who is dying with HIV/AIDS and how this has changed over time, these tables and accompanying fact sheet present a profile of deaths among individuals diagnosed with HIV infection and AIDS for the 6 year period of 1999 – 2004.

Additionally, information about deaths among people reported with AIDS for the ten year period 1995 to 2004, as well as the years 1985 and 1990, are included for historical perspective. Death data are not available for people reported with HIV infection (non-AIDS) prior to 1999, as HIV infection was not a reportable condition before this time.

Death data presented in this analysis include all deaths among people reported with HIV infection and those with AIDS in Massachusetts. This includes deaths from *non-HIV related* causes, such as motor vehicle crashes, drug overdoses and suicides. Therefore, the number of deaths reported here will vary from the number of *HIV-related* deaths reported in *Massachusetts Deaths* by the Massachusetts Department of Public Health, Center for Health Information, Statistics, Research and Evaluation.

On an annual basis, the HIV/AIDS Surveillance program matches all reports of individuals living with HIV/AIDS against that year's vital statistics file of all individuals who died within Massachusetts. Additionally, death certificates with HIV/AIDS among reported underlying conditions are received by the HIV/AIDS Surveillance Program and providers may report deaths among their patients.

**Table 1. Ranking of 10 leading causes of death among persons 25-44 years of age: Massachusetts, 2003**

Cause	Ranking	N	% of Total Deaths (N=2,484)
Injuries of undetermined intent	1	426	17%
Cancer	2	413	17%
Unintentional injuries	3	289	12%
Heart disease	4	268	11%
Suicide	5	177	7%
Signs and symptoms <sup>1</sup>	6	110	4%
<b>HIV/AIDS</b>	<b>7</b>	<b>108</b>	<b>4%</b>
Chronic liver disease	8	52	2%
Homicide	8	52	2%
Diabetes	9	50	2%

<sup>1</sup> Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified (R00-R99). This category includes symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified.  
Data Source: Center for Health Information, Statistics, Research and Evaluation, Massachusetts Deaths 2003, available online at <http://www.mass.gov/dph/bhsre/death/2003/report.pdf>

**Table 2. Deaths among persons reported with HIV infection (non-AIDS) and AIDS by year of death: Massachusetts, 1985 - 2004<sup>2</sup>**

	HIV	AIDS	Total HIV + AIDS
Year of Death	N	N	
1985	-- <sup>1</sup>	119	-- <sup>1</sup>
1990	-- <sup>1</sup>	632	-- <sup>1</sup>
1995	-- <sup>1</sup>	1,184	-- <sup>1</sup>
1996	-- <sup>1</sup>	795	-- <sup>1</sup>
1997	-- <sup>1</sup>	388	-- <sup>1</sup>
1998	-- <sup>1</sup>	332	-- <sup>1</sup>
1999	48	349	397
2000	39	335	374
2001	55	369	424
2002	60	316	376
2003	65	255	320
2004 <sup>2</sup>	58	269	327

<sup>1</sup> HIV Reporting was implemented in 1999, therefore there are no data for deaths among people with HIV who did not progress to AIDS during this time period.

<sup>2</sup> 2004 data are preliminary

Data Source MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

<b>Table 3. Deaths among persons reported with HIV and AIDS by gender, race/ethnicity and exposure mode: Massachusetts, 1999-2004</b>					
	<b>HIV</b>		<b>AIDS</b>		<b>Total</b>
<b>Gender:</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>
Male	222	68%	1,384	73%	<b>1,606</b>
Female	103	32%	509	27%	<b>612</b>
<b>Race/Ethnicity:</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>
White Non-Hispanic	169	52%	941	50%	<b>1,110</b>
Black Non-Hispanic	86	26%	484	26%	<b>570</b>
Hispanic	63	19%	451	24%	<b>514</b>
Asian/Pacific Islander	3	1%	10	1%	<b>13</b>
American Indian/Alaska Native	1	<1%	4	<1%	<b>5</b>
Unknown	3	1%	3	<1%	<b>6</b>
<b>Exposure Mode:</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>
Male-to-male Sex (MSM)	54	17%	380	20%	<b>434</b>
Injection Drug Use (IDU)	194	60%	981	52%	<b>1,175</b>
MSM/IDU	8	2%	93	5%	<b>101</b>
Heterosexual Sex (HTSX)	23	7%	160	8%	<b>183</b>
Other	2	1%	55	3%	<b>57</b>
Total Undetermined	44	14%	224	12%	<b>268</b>
• Presumed HTSX <sup>1</sup>	26	8%	130	7%	<b>156</b>
• Undetermined <sup>2</sup>	18	6%	94	5%	<b>112</b>
<b>Total</b>	<b>325</b>	<b>100%</b>	<b>1,893</b>	<b>100%</b>	<b>2,218</b>

<sup>1</sup> Heterosexual sex with partners with unknown risk and HIV status  
<sup>2</sup> Includes those still being followed up for risk information, those who have died with no determined risk, and those lost to follow-up  
 Data Source MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

*Note: The category of “presumed heterosexual” is used in Massachusetts to re-assign people who are reported with no identified risk but who are known to have not reported any other risks except heterosexual sex with a partner of unknown HIV status or risk. Massachusetts uses this category to distinguish these cases from other undetermined cases about which we know less. Nationally, the Centers for Disease Control and Prevention categorizes “presumed heterosexual” cases as “no identified risk” (NIR). As such, comparisons of the presumed heterosexual category cannot be made to national data. Caution should be used in interpreting data for presumed heterosexual, as it is still not clear what the exposure risk is for people in this category. Although a person may not report other risk behaviors such as injection drug use or male-to-male sex to his/her health care provider, it does not necessarily mean that he/she has not engaged in them. There are many barriers to disclosing HIV risk behaviors in the health care setting such as a limited patient-provider relationship or stigma.*

## Technical Notes: Trends in progression to AIDS after HIV infection diagnosis

The following analyses describe progression to an AIDS diagnosis among people who are diagnosed with HIV infection in Massachusetts.

Table 14 describes how many people progressed to AIDS within 2 months of HIV infection diagnosis, between 1 and 2 years, between 2 and 3 years, etc., and those who have not been diagnosed with AIDS, for all people diagnosed with HIV infection from 1999 to 2003.

<b>Table 4. Time from HIV infection diagnosis to AIDS diagnosis by year of HIV infection diagnosis: Massachusetts, 1999-2003</b>										
Year of HIV infection	1999		2000		2001		2002		2003	
HIV to AIDS <sup>1</sup>	N	%	N	%	N	%	N	%	N	%
<2 months	349	27%	309	27%	294	30%	284	28%	254	28%
2 months - <1 yr.	168	13%	135	12%	106	11%	104	10%	77	9%
1 - <2 yr.	57	4%	36	3%	47	5%	35	3%	32	4%
2 - <3 yr.	34	3%	21	2%	14	1%	25	2%	6	1%
3 - <4 yr.	26	2%	22	2%	15	2%	2	<1%	-- <sup>2</sup>	-- <sup>2</sup>
4 - <5	11	1%	11	1%	4	<1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
5 - <6	14	1%	0	0%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
6 - <7	4	<1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
HIV DX only <sup>3</sup>	653	50%	610	53%	508	51%	580	56%	527	59%
<b>Total</b>	<b>1,316</b>	<b>100%</b>	<b>1,144</b>	<b>100%</b>	<b>988</b>	<b>100%</b>	<b>1,030</b>	<b>100%</b>	<b>896</b>	<b>100%</b>

<sup>1</sup> Time from HIV infection diagnosis to AIDS diagnosis  
<sup>2</sup> Individuals diagnosed with HIV infection in this year have not yet had the opportunity to be living with HIV infection for this many years before progressing to AIDS  
<sup>3</sup> HIV infection diagnosis only, individuals have not yet progressed to AIDS  
 Data Source: MDPH Surveillance Program; Data as of 7/1/05

**Table 5. Deaths among persons reported with HIV/AIDS by gender and year of death: Massachusetts, 1999 - 2004**

Year of Death	Male		Female		Total
	N	%	N	%	N
1999	303	76%	94	24%	397
2000	271	72%	103	28%	374
2001	304	72%	120	28%	424
2002	270	72%	106	28%	376
2003	212	66%	108	34%	320
2004	246	75%	81	25%	327

Data Source MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

**Table 6. Deaths among persons reported with HIV/AIDS by place of birth and year of death: Massachusetts, 1999 - 2004**

Year of Death	US		Puerto Rico/ US Dependency <sup>1</sup>		Non-US		Total
	N	%	N	%	N	%	N
1999	298	75%	77	19%	22	6%	397
2000	286	76%	68	18%	20	5%	374
2001	337	79%	52	12%	35	8%	424
2002	287	76%	52	14%	37	10%	376
2003	255	80%	41	13%	24	8%	320
2004	253	77%	49	15%	25	8%	327

<sup>1</sup> 97% of people diagnosed with AIDS who were born in a US Dependency were born in Puerto Rico

Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

<b>Table 7. Deaths among persons reported with HIV/AIDS by race/ethnicity and year of death: Massachusetts, 1999 - 2004</b>											
<b>Year of Death</b>	<b>White NH</b>		<b>Black NH</b>		<b>Hispanic</b>		<b>API</b>		<b>AI/AN</b>		<b>Total</b>
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N<sup>1</sup></b>
1999	188	47%	97	24%	107	27%	2	1%	3	1%	<b>397</b>
2000	189	51%	88	24%	94	25%	2	1%	1	<1%	<b>374</b>
2001	230	54%	116	27%	77	18%	0	0%	1	<1%	<b>424</b>
2002	174	46%	113	30%	85	23%	3	1%	0	0%	<b>376</b>
2003	163	51%	83	26%	72	23%	1	<1%	0	0%	<b>320</b>
2004	166	51%	73	22%	79	24%	5	2%	0	0%	<b>327</b>
<sup>1</sup> Totals includes people of unknown race/ethnicity NH=Non-Hispanic, API=Asian/Pacific Islander, AI/AN=American Indian/Alaska Native Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05											

<b>Table 8. Deaths among <i>MALES</i> reported with HIV/AIDS by race/ethnicity and year of death: Massachusetts, 1999 - 2004</b>											
<b>Year of Death</b>	<b>White NH</b>		<b>Black NH</b>		<b>Hispanic</b>		<b>API</b>		<b>AI/AN</b>		<b>Total</b>
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N<sup>1</sup></b>
1999	151	50%	72	24%	76	25%	2	1%	2	1%	<b>303</b>
2000	149	55%	54	20%	65	24%	2	1%	1	<1%	<b>271</b>
2001	169	56%	77	25%	57	19%	0	0%	1	<1%	<b>304</b>
2002	135	50%	73	27%	58	21%	3	1%	0	0%	<b>270</b>
2003	106	50%	51	24%	53	25%	1	<1%	0	0%	<b>212</b>
2004	133	54%	53	22%	53	22%	5	2%	0	0%	<b>246</b>
<sup>1</sup> Totals includes people of unknown race/ethnicity NH=Non-Hispanic, API=Asian/Pacific Islander, AI/AN=American Indian/Alaska Native Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05											

**Table 9. Deaths among *FEMALES* reported with HIV/AIDS by race/ethnicity and year of death: Massachusetts, 1999 - 2004**

Year of Death	White NH		Black NH		Hispanic		API		AI/AN		Total
	N	%	N	%	N	%	N	%	N	%	N <sup>1</sup>
1999	37	39%	25	27%	31	33%	0	0%	1	1%	<b>94</b>
2000	40	39%	34	33%	29	28%	0	0%	0	0%	<b>103</b>
2001	61	51%	39	33%	20	17%	0	0%	0	0%	<b>120</b>
2002	39	37%	40	38%	27	25%	0	0%	0	0%	<b>106</b>
2003	57	53%	32	30%	19	18%	0	0%	0	0%	<b>108</b>
2004	33	41%	20	25%	26	32%	0	0%	0	0%	<b>81</b>

<sup>1</sup> Totals includes people of unknown race/ethnicity

NH=Non-Hispanic, API=Asian/Pacific Islander, AI/AN=American Indian/Alaska Native

Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

**Table 10. Deaths among persons reported with HIV/AIDS by exposure mode and year of death: Massachusetts, 1999 - 2004**

	MSM		IDU		MSM/ IDU		HTSX		Other		Pres. HTSX <sup>1</sup>		Undeter- mined <sup>2</sup>		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1999	72	18%	213	54%	18	5%	33	8%	14	4%	30	8%	17	4%	<b>397</b>
2000	76	20%	203	54%	16	4%	25	7%	13	3%	27	7%	14	4%	<b>374</b>
2001	91	21%	219	52%	20	5%	29	7%	7	2%	29	7%	29	7%	<b>424</b>
2002	75	20%	203	54%	17	5%	35	9%	9	2%	25	7%	12	3%	<b>376</b>
2003	58	18%	169	53%	13	4%	36	11%	6	2%	20	6%	18	6%	<b>320</b>
2004	62	19%	168	51%	17	5%	25	8%	8	2%	25	8%	22	7%	<b>327</b>

MSM=Male-to-male sex; IDU=Injection Drug Use; HTSX=Heterosexual Sex; Und.=Undetermined; P.=Presumed; N/A=Not Applicable

<sup>1</sup> Heterosexual sex with partners with unknown risk and HIV status

<sup>2</sup> Includes those still being followed up for risk information, those who have died with no determined risk, and those lost to follow-up

Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

**Table 11. Deaths among *MALES* reported with HIV/AIDS by exposure mode and year of death: Massachusetts, 1999 - 2004**

	MSM		IDU		MSM/ IDU		HTSX		Other		Pres. HTSX <sup>1</sup>		Undeter- -mined <sup>2</sup>		Total
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N
1999	72	24%	159	52%	18	6%	10	3%	11	4%	17	6%	16	5%	<b>303</b>
2000	76	28%	135	50%	16	6%	4	1%	10	4%	16	6%	14	5%	<b>271</b>
2001	91	30%	138	45%	20	7%	12	4%	2	1%	15	5%	26	9%	<b>304</b>
2002	75	28%	135	50%	17	6%	10	4%	6	2%	16	6%	11	4%	<b>270</b>
2003	58	27%	105	50%	13	6%	14	7%	3	1%	13	6%	6	3%	<b>212</b>
2004	62	25%	116	47%	17	7%	13	5%	7	3%	14	6%	17	7%	<b>246</b>

MSM=Male-to-male sex; IDU=Injection Drug Use; HTSX=Heterosexual Sex; Und.=Undetermined; P.=Presumed; N/A=Not Applicable

<sup>1</sup> Heterosexual sex with partners with unknown risk and HIV status

<sup>2</sup> Includes those still being followed up for risk information, those who have died with no determined risk, and those lost to follow-up

Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05

**Table 12. Deaths among *FEMALES* reported with HIV/AIDS by exposure mode and year of death: Massachusetts, 1999 - 2004**

	IDU		HTSX		Other		Pres. HTSX <sup>1</sup>		Undeter- -mined <sup>2</sup>		Total
	N	%	N	%	N	%	N	%	N	%	N
1999	54	57%	23	24%	3	3%	13	14%	1	1%	<b>94</b>
2000	68	66%	21	20%	3	3%	11	11%	0	0%	<b>103</b>
2001	81	68%	17	14%	5	4%	14	12%	3	3%	<b>120</b>
2002	68	64%	25	24%	3	3%	9	8%	1	1%	<b>106</b>
2003	64	59%	22	20%	3	3%	7	6%	12	11%	<b>108</b>
2004	52	64%	12	15%	1	1%	11	14%	5	6%	<b>81</b>

IDU=Injection Drug Use; HTSX=Heterosexual Sex; Und.=Undetermined; P.=Presumed; N/A=Not Applicable

<sup>1</sup> Heterosexual sex with partners with unknown risk and HIV status

<sup>2</sup> Includes those still being followed up for risk information, those who have died with no determined risk, and those lost to follow-up

Data Source: MDPH HIV/AIDS Surveillance Program (percentages may not add up to 100% due to rounding), Data as of 7/1/05



## Technical Notes: Explanation of Crude and Age-Adjusted Rates of Death

A rate of a disease per 100,000 population is a more precise way to compare groups that have substantially different population sizes rather than relying on the raw number of deaths. To adjust for fluctuations in the annual rate of death among people reported with HIV/AIDS, an average annual rate of death for the period 2002 to 2004 is used. The average number of deaths is calculated over the three-year period by adding the total number of deaths among people reported with HIV/AIDS in each of the three years and dividing by three. The crude average annual rate of death is then calculated by dividing the average number of people reported with HIV/AIDS who died during the three years by the entire population (everyone or the sub-population involved) and multiplying by 100,000. (See example 1 below). The Massachusetts Department of Public Health (DPH) Race-Allocated Census 2000 Estimates (MRACE) file is the source of population sizes for these calculations.

### Example 1: Calculation of Crude Average Annual Rate of Death among People Reported with HIV/AIDS for White Individuals, Massachusetts, 2001-2003 (3.1 per 100,000)

$$\begin{aligned} \text{Crude average annual rate of} & \\ \text{death among reported} & \\ \text{HIV/AIDS cases for white} & \\ \text{individuals, 2002-2004} & = ((\text{number of white individuals reported with HIV/AIDS} \\ & \text{who died in 2002} + \text{number of white individuals reported} \\ & \text{with HIV/AIDS who died in 2003} + \text{number of white} \\ & \text{individuals reported with HIV/AIDS who died in 2004}) \div 3)) \\ & \div (\text{population size of white individuals}) \times 100,000 \\ & = (((174 + 163 + 166) \div 3)) \div 5,326,585) \times 100,000 \\ & = ((503 \div 3) \div 5,326,585) \times 100,000 \\ & = (167.67 \div 5,326,585) \times 100,000 \\ & = 0.0000314 \times 100,000 \\ & = 3.1 \end{aligned}$$

Sometimes, in addition to the population size being different, the age composition of the populations is different. In Massachusetts, black and Hispanic populations are younger than white. The median age of black people (29.7 years) and Hispanic people (24.5 years) is younger than that of white people (38.8 years). Therefore, it is necessary to “age-adjust” the rate of death among people reported with HIV/AIDS to get a true comparison of the impact of the disease across racial/ethnic groups without an effect from the differences in age composition. Age-adjustment of rates minimizes the distortion created by differences in age composition.

Age-adjusted rates are calculated by weighting the age-specific rates for a given population by the age distribution of a standard population. The age-specific rates are calculated for eleven age groups ranging from less than one year old to 85 years or above and are weighted by the 2000 US standard population. The weighted age-

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specific rates are then added to produce the adjusted rate for all ages combined. (See example 2 below).

**Example 2: Calculation of Age-adjusted Rate of Death among People Reported with HIV/AIDS for White Individuals, Massachusetts, 2002-2004, (3.0 per 100,000)**

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>Age group (in years)</i>	<i>Average number of deaths among reported HIV/AIDS cases 2002-2004</i>	<i>Population (2000)</i>	<i>2000 US standard population weight</i>	<i>Age-adjusted rate ((B÷C×D)×100,000)</i>
<1	0.000000	61,381	0.013818	0.000000
1-4	0.000000	245,562	0.055317	0.000000
5-14	0.000000	675,388	0.145565	0.000000
15-24	1.333333	634,387	0.138646	0.0291402
25-34	6.333333	734,417	0.135573	0.116913
35-44	59.000000	902,498	0.162613	1.063068
45-54	71.333333	771,970	0.134834	1.2459239
55-64	24.333333	491,985	0.087247	0.4315193
65-74	4.000000	396,458	0.066037	0.066627
75-84	1.333333	300,442	0.044842	0.0199005
85+ years	0.000000	112,097	0.015508	0.000000
<b>Total</b>				
				<b>3.0</b>

To see the effect of age-distribution on rates of death see Table 8 below for a comparison of crude and age-adjusted rates by race/ethnicity.

**Table 13. Crude and age-adjusted rates of death among people reported with HIV/AIDS per 100,000 population by race/ethnicity and gender: average annual rate 2002 – 2004, Massachusetts**

	<b>Crude Rate per 100,000</b>	<b>Age-Adjusted Rate per 100,000</b>
<b>State Total:</b>		
White (non-Hispanic)	3.1	3.0
Black (non-Hispanic)	26.6	30.2
Hispanic	18.3	25.3
Asian/Pacific Islander	1.2	1.2
American Indian/Alaskan Native	0.0	0.0
<b>MA Total Rate</b>	<b>5.4</b>	<b>5.3</b>
<b>Males:</b>	<b>Crude Rate per 100,000</b>	<b>Age-Adjusted Rate per 100,000</b>
White (non-Hispanic) Males	4.9	4.5
Black (non-Hispanic) Males	36.4	43.0
Hispanic Males	25.8	39.1
Asian/Pacific Islander Males	2.5	2.4
American Indian/Alaskan Native Males	0.0	0.0
<b>MA Total Rate Among Males</b>	<b>7.9</b>	<b>7.7</b>
<b>Females:</b>	<b>Crude Rate per 100,000</b>	<b>Age-Adjusted Rate per 100,000</b>
White (non-Hispanic) Females	1.6	1.5
Black (non-Hispanic) Females	17.6	19.1
Hispanic Females	11.1	13.4
Asian/Pacific Islander Females	0.0	0.0
American Indian/Alaskan Native Females	0.0	0.0
<b>MA Total Rate Among Females</b>	<b>3.0</b>	<b>2.9</b>
<sup>1</sup> The denominators for rate calculations are based on year 2000 population estimates from the MDPH Center for Health Information, Statistics, Research and Evaluation, all rates are age-adjusted using the 2000 US standard population Data Source: MDPH HIV/AIDS Surveillance Program; Data as of 7/1/05		

## Technical Notes: Explanation of Case Fatality Rate

The case fatality rate reflects the severity of a disease. For HIV/AIDS, it represents the proportion of people reported with HIV/AIDS who died in a specific time period and is usually expressed as a percentage. To adjust for fluctuations in the number of annual deaths among people reported with HIV/AIDS, an average annual case fatality rate for the period 2002 to 2004 is used. The average number of deaths is calculated over the three-year period by adding the total number of deaths among people reported with HIV/AIDS in each of the three years and dividing by three. The average number of people living with HIV/AIDS is calculated by adding the number of people living with HIV/AIDS on January 1<sup>st</sup> of each year to the number of people newly diagnosed with HIV infection in that year for each of the three years and dividing by three. The average annual case fatality rate is then calculated by dividing the average number of people reported with HIV/AIDS who died during the three years by the average number of people living with HIV/AIDS. (See example 1 below).

### Example 1: Calculation of Average Annual HIV/AIDS Case Fatality Rate for White Individuals, Massachusetts, 2002-2004, (2.3%)

Average annual HIV/AIDS case fatality rate for white individuals, 2002-2004

$$\begin{aligned} &= ((\text{number of white individuals reported with HIV/AIDS who died in 2002} + \text{number of white individuals reported with HIV/AIDS who died in 2003} + \text{number of white individuals reported with HIV/AIDS who died in 2004}) \div 3) \\ &\div ((\text{number of white individuals living with HIV/AIDS on 1/1/2002} + \text{number of white individuals reported with HIV diagnosis in 2002} + \text{number of white individuals living with HIV/AIDS on 1/1/2003} + \text{number of white individuals reported with HIV diagnosis in 2003} + \text{number of white individuals living with HIV/AIDS on 1/1/2004} + \text{number of white individuals reported with HIV diagnosis in 2004}) \div 3) \\ &= (((174 + 163 + 166) \div 3)) \div (((6,669 + 406 + 6,861 + 355 + 7,013 + 318) \div 3)) \\ &= ((503 \div 3) \div (2,1622 \div 3)) \\ &= (167.67 \div 7,207.33) \\ &= 0.0233 \\ &= \mathbf{2.3\%} \end{aligned}$$

**Table 14. HIV/AIDS case fatality rate<sup>1</sup> by exposure mode: average annual rate 2002 – 2004, Massachusetts**

State Total:	Case Fatality Rate <sup>1</sup>
Male-to-male Sex	1.3%
Injection Drug Use	4.0%
Male-to-male Sex/Injection Drug Use	3.1%
Heterosexual Sex	1.5%
Other	1.9%
Presumed Heterosexual Sex <sup>2</sup>	1.0%
Undetermined <sup>3</sup>	2.1%
<b>MA Total Rate</b>	<b>2.2%</b>

<sup>1</sup> Case fatality rate = (number of people who died with HIV/AIDS in year) ÷ (number of people living with HIV/AIDS on 1/1 of year + number of people diagnosed with HIV infection during that year)

<sup>2</sup> Heterosexual sex with partners with unknown risk and HIV status

<sup>3</sup> Includes those still being followed up for risk information, those who have died with no determined risk, and those lost to follow-up

Data Source: MDPH HIV/AIDS Surveillance Program, Data as of 7/1/05

**Table 15. HIV/AIDS case fatality rate<sup>1</sup> by place of birth: average annual rate 2002 – 2004, Massachusetts**

State Total:	Case Fatality Rate <sup>1</sup>
United States	2.5%
Puerto Rico/Other US Dependency <sup>2</sup>	2.5%
Non-US	1.1%
<b>MA Total Rate</b>	<b>2.2%</b>

<sup>1</sup> Case fatality rate = (number of people who died with HIV/AIDS in year) ÷ (number of people living with HIV/AIDS on 1/1 of year + number of people diagnosed with HIV infection during that year)

<sup>2</sup> 97% of people diagnosed with AIDS who were born in a US Dependency were born in Puerto Rico

Data Source: MDPH HIV/AIDS Surveillance Program, Data as of 7/1/05

<b>Table 16. HIV/AIDS case fatality rate<sup>1</sup> by race/ethnicity<sup>2</sup> and gender: average annual rate 2002 – 2004, Massachusetts</b>	
<b>State Total:</b>	<b>Case Fatality Rate<sup>1</sup></b>
White (non-Hispanic)	2.3%
Black (non-Hispanic)	2.1%
Hispanic	2.0%
<b>MA Total Rate</b>	<b>2.2%</b>
<b>Males:</b>	<b>Case Fatality Rate<sup>1</sup></b>
White (non-Hispanic) Males	2.1%
Black (non-Hispanic) Males	2.3%
Hispanic Males	2.1%
<b>MA Total Rate Among Males</b>	<b>2.2%</b>
<b>Females:</b>	<b>Case Fatality Rate<sup>1</sup></b>
White (non-Hispanic) Females	3.1%
Black (non-Hispanic) Females	1.7%
Hispanic Females	1.9%
<b>MA Total Rate Among Females</b>	<b>2.2%</b>
<sup>1</sup> Case fatality rate = (number of people who died with HIV/AIDS in year) ÷ (number of people living with HIV/AIDS on 1/1 of year + number of people diagnosed with HIV infection during that year) <sup>2</sup> Rates for Asian/Pacific Islanders and American Indian/Alaska Natives are not presented due to small numbers Data Source: MDPH HIV/AIDS Surveillance Program; Data as of 7/1/05	

## **Technical Notes: Trends in survival after an AIDS diagnosis**

The following analyses describe changes over time in the survival of people who are diagnosed with AIDS in Massachusetts.

Tables 11-13 describe how many people died within 1 year of an AIDS diagnosis, between 1 and 2 years, between 2 and 3 years, etc., and up to 10 or more years for all people diagnosed with AIDS from 1987 to 2002. For example, the first column of Table 11 indicates that of 651 people diagnosed with AIDS in 1987, 265, or 41%, died within 1 year of their diagnosis; 159, or 24%, died between 1 and 2 years of their diagnosis; and 94, or 14%, died between 2 and 3 years of their diagnosis.

It should be noted that if a person was diagnosed with AIDS in 2003, only one complete year of survival can be assessed, since this report includes data only up to July 1, 2005. Likewise, a diagnosis of AIDS in 2002 would not allow observation for more than two years, etc. These observations are relevant when interpreting the following tables and especially when comparing the distribution of survival times across years. With these caveats in mind, there has been a fairly consistent decline in the percentage of people who die within two years of an AIDS diagnosis. This most likely reflects higher rates of early diagnosis, and improved care and treatment of people living with AIDS in the Commonwealth.

In comparing survival for people diagnosed in 1988 with people diagnosed in more recent years, it is evident that the proportion of people who are still alive is greater for each successive time period. More people are surviving for longer time periods after being diagnosed with AIDS. The increase in survival time could mean that people truly are living longer, or it could be a result of changes in reporting. Regarding the latter, the AIDS case definition was expanded in 1993 to include people with a CD4 count below 200. This change in the case definition would mean that as of 1993, more people are counted as having an AIDS diagnosis although they are not as sick as those diagnosed with AIDS in earlier years, leading to longer survival. At the same time, significant advances in treatment over the years certainly account for a significant increase in survival. The increases in survival in the late 80s and early 90s are due in part to the introduction of *Pneumocystis carinii* pneumonia (PCP) prophylaxis, and the movement towards earlier diagnosis and initiation of antiretroviral treatment. Increases in survival in the mid 90's are explained mostly by highly effective antiretroviral therapy.

<b>Table 17. Time from AIDS diagnosis to death by year of AIDS diagnosis: Massachusetts, 1987-1991</b>										
	<b>1987</b>		<b>1988</b>		<b>1989</b>		<b>1990</b>		<b>1991</b>	
Survival time <sup>1</sup>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
<1 yr.	265	41%	277	32%	285	29%	290	27%	362	27%
1 - <2 yr.	159	24%	208	24%	230	23%	215	20%	308	23%
2 - <3 yr.	94	14%	136	16%	163	16%	193	18%	200	15%
3 - <4 yr.	43	7%	70	8%	89	9%	116	11%	119	9%
4 - <5 yr.	18	3%	34	4%	63	6%	60	6%	68	5%
5 - <6 yr.	9	1%	24	3%	46	5%	39	4%	35	3%
6 - <7 yr.	7	1%	13	2%	17	2%	14	1%	13	1%
7 - <8 yr.	5	1%	11	1%	6	1%	10	1%	13	1%
8 - <9 yr.	9	1%	3	<1%	6	1%	11	1%	9	1%
9 - <10 yr.	0	0%	2	<1%	4	<1%	6	1%	7	1%
10+ yr.	9	1%	15	2%	17	2%	15	1%	19	1%
Still Alive	31	5%	66	8%	74	7%	110	10%	176	13%
<b>Total<sup>2</sup></b>	<b>651</b>	<b>100%</b>	<b>860</b>	<b>100%</b>	<b>1,000</b>	<b>100%</b>	<b>1,079</b>	<b>100%</b>	<b>1,331</b>	<b>100%</b>

<sup>1</sup> Years between AIDS diagnosis and death  
<sup>2</sup> Totals include 11 individuals diagnosed with AIDS between 1987 and 2002 where the years between AIDS diagnosis and death is unknown; Data Source: MDPH Surveillance Program; Data as of 7/1/05



<b>Table 18. Time from AIDS diagnosis to death by year of AIDS diagnosis: Massachusetts, 1992-1996</b>										
	<b>1992</b>		<b>1993</b>		<b>1994</b>		<b>1995</b>		<b>1996</b>	
Survival time <sup>1</sup>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
<1 yr.	371	21%	350	20%	301	20%	215	15%	109	9%
1 - <2 yr.	378	22%	357	20%	254	17%	105	8%	45	4%
2 - <3 yr.	304	17%	257	15%	117	8%	58	4%	50	4%
3 - <4 yr.	170	10%	110	6%	54	4%	52	4%	48	4%
4 - <5 yr.	55	3%	51	3%	36	2%	41	3%	41	4%
5 - <6 yr.	32	2%	35	2%	44	3%	37	3%	36	3%
6 - <7 yr.	38	2%	33	2%	26	2%	38	3%	34	3%
7 - <8 yr.	15	1%	34	2%	44	3%	41	3%	21	2%
8 - <9 yr.	33	2%	20	1%	20	1%	22	2%	11	1%
9 - <10 yr.	20	1%	20	1%	15	1%	14	1%	-- <sup>2</sup>	-- <sup>2</sup>
10+ yr.	35	2%	24	1%	18	1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
Still Alive	298	17%	469	27%	548	37%	776	55%	765	66%
<b>Total<sup>3</sup></b>	<b>1,751</b>	<b>100%</b>	<b>1,761</b>	<b>100%</b>	<b>1,478</b>	<b>100%</b>	<b>1,399</b>	<b>100%</b>	<b>1,161</b>	<b>100%</b>
<sup>1</sup> Years between AIDS diagnosis and death <sup>2</sup> Individuals diagnosed in this year have not yet had the opportunity to survive this many years before death <sup>3</sup> Totals include 11 individuals diagnosed with AIDS between 1987 and 2002 where the years between AIDS diagnosis and death is unknown; Data Source: MDPH Surveillance Program; Data as of 7/1/05										

<b>Table 19. Time from AIDS diagnosis to death by year of AIDS diagnosis: Massachusetts, 1997- 2002</b>												
	<b>1997</b>		<b>1998</b>		<b>1999</b>		<b>2000</b>		<b>2001</b>		<b>2002</b>	
<b>Survival time<sup>1</sup></b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
<1 yr.	71	8%	58	6%	66	7%	58	8%	64	9%	42	7%
1 - <2 yr.	39	4%	41	4%	31	3%	20	3%	21	3%	11	2%
2 - <3 yr.	35	4%	19	2%	38	4%	23	3%	18	3%	10	2%
3 - <4 yr.	35	4%	23	2%	21	2%	15	2%	8	1%	-- <sup>2</sup>	-- <sup>2</sup>
4 - <5 yr.	36	4%	24	3%	20	2%	15	2%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
5 - <6 yr.	21	2%	24	3%	11	1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
6 - <7 yr.	18	2%	13	1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
7 - <8 yr.	12	1%	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
8 - <9 yr.	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
9 - <10 yr.	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
10+ yr.	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>	-- <sup>2</sup>
<b>Still Alive</b>	<b>649</b>	<b>71%</b>	<b>758</b>	<b>79%</b>	<b>728</b>	<b>80%</b>	<b>636</b>	<b>83%</b>	<b>579</b>	<b>84%</b>	<b>580</b>	<b>90%</b>
<b>Total<sup>3</sup></b>	<b>916</b>	<b>100%</b>	<b>960</b>	<b>100%</b>	<b>915</b>	<b>100%</b>	<b>767</b>	<b>100%</b>	<b>690</b>	<b>100%</b>	<b>644</b>	<b>100%</b>
<sup>1</sup> Years between AIDS diagnosis and death <sup>2</sup> Individuals diagnosed in this year have not yet had the opportunity to survive this many years before death <sup>3</sup> Totals include 11 individuals diagnosed with AIDS between 1987 and 2002 where the years between AIDS diagnosis and death is unknown; Data Source: MDPH Surveillance Program; Data as of 7/1/05												